

What is claimed is:

1. A waveguide coupler for connecting between rectangular waveguide terminals formed in two dielectric substrates arranged  
5 opposite to each other, wherein

each of said dielectric substrates includes a contact region which conducts electricity to a grounded conductor of said waveguide terminal, one said contact region being arranged to surround said waveguide terminal at a position opposite to the other said contact region when both said waveguide terminals are connected together,  
10 and

said dielectric substrates are joined together with an electrically conductive joint member disposed between said opposing contact regions.

2. The waveguide coupler according to claim 1,

wherein a plurality of said electrically conductive joint members are sandwiched between said dielectric substrates and arranged to surround said waveguide terminals.

3. The waveguide coupler according to claim 1,

wherein said electrically conductive joint members are ball-shaped, barrel-shaped, or cylindrical.

4. The waveguide coupler according to claim 2,

wherein said two dielectric substrates have different coefficients of linear expansion.

5. The waveguide coupler according to claim 2,

wherein a gap between adjacent said electrically conductive joint members is equal to, or less than 1/4 of the wavelength of a high frequency signal passing through said waveguide terminals.

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6. The waveguide coupler according to claim 5, wherein

said multiple electrically conductive joint members are arranged in a row on the circumference of a rectangle having four sides, each side parallel to either longer or shorter sides of said rectangular waveguide terminal, and

a distance L1 and a distance L2 are determined to satisfy a relationship

$$\lambda \times (0.7 \text{ to } 1.3) = 2 / (1/L1^2 + 1/L2^2)^{1/2}$$

wherein L1 is a distance between first rows of said electrically conductive joint members disposed on opposing two sides of said rectangle running in parallel with said shorter sides of said waveguide terminal, L2 is a distance between (said longer sides?) of said waveguide terminal and second rows of said electrically conductive joint members disposed on opposing two sides of said rectangle running in parallel with said longer sides of said waveguide terminal, and  $\lambda$  is a wavelength of the high frequency signal passing through said waveguide terminals.

7. The waveguide coupler according to claim 5, wherein

said multiple electrically conductive joint members are arranged in a row on the circumference of a rectangle having four sides, each side parallel to either longer or shorter sides of said rectangular waveguide terminal, and

it is determined that both a distance between said shorter sides of said waveguide terminal and first rows of said electrically conductive joint members disposed on opposing two sides of said rectangle running in parallel with said shorter sides of said waveguide terminal, and a distance between said longer sides of said waveguide terminal and second rows of said conductive joint members disposed on opposing two sides of said rectangle running in parallel with said longer sides of said waveguide terminal are equal to, or less than 0.5 mm.

8. The waveguide coupler according to claim 1, wherein

at least one among said dielectric substrates includes a grounded conductive surface formed on the surface of said substrate opposing the other said dielectric substrate for conducting electricity to the grounded conductor of said waveguide terminal, and a resist film for the joint members formed on said grounded conductive surface for preventing the attachment of said electrically conductive joint members,

a region of said grounded conductive surface serves as said contact region, and

said resist film for the joint members is formed in a pattern having an aperture for said contact region.

9. The waveguide coupler according to claim 1,

wherein at least one among said dielectric substrates is multi-layered and includes a plurality of pads serving as said contact region, said pads being formed on the surface of said dielectric substrate for conducting electricity to the grounded

conductor of said waveguide terminal via an internal layer of said dielectric substrate and a through hole.

10. The waveguide coupler according to claim 1, wherein at least  
5 one among said dielectric substrates comprises:

a grounded conductive surface formed on the surface of said dielectric substrate opposing the other said dielectric substrate for conducting electricity to the grounded conductor of said waveguide terminal,

10 a plurality of pads formed on the same surface of said dielectric substrate as said grounded conductive surface for serving as said contact region, and

15 a connecting wire for electrically connecting each of said pads to said grounded conductive surface.

11. The waveguide coupler according to claim 1,

20 wherein said contact region of said at least one said dielectric substrate is divided into a plurality of regions surrounded by a solder resist, each region being provided with a plurality of said multiple conducting joint members.

12. The waveguide coupler according to claim 1,

25 wherein said at least one said dielectric substrate includes a plurality of said electrically conductive joint members arranged in rows parallel with a side of said rectangular waveguide terminal, with two or more rows being allocated for each side.

13. The waveguide coupler according to claim 12,

wherein a gap between said rows of said electrically conductive joint members running in parallel with each side of said waveguide terminal is in the range of  $\pm 30\%$  of  $1/4$  of the wavelength of a high frequency signal passing through said waveguide terminals.

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14. The waveguide coupler according to claim 1, wherein

said at least one said dielectric substrate includes two or more waveguide terminals formed in said dielectric substrate,

said contact region is arranged on the circumference of each of said waveguide terminals so as to surround each of said waveguide terminals, and

said contact region formed corresponding to opposing sides of adjacent said rectangular waveguide terminals is shared by said adjacent waveguide terminals.

15. The waveguide coupler according to claim 1,

wherein said electrically conductive joint member is formed of solder and said two dielectric substrates are joined together by soldering.

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16. The waveguide coupler according to claim 1,

wherein said electrically conductive joint member is an electrically conductive adhesive.

25 17. The waveguide coupler according to claim 1,

wherein said electrically conductive joint member is a metal or a material containing metal, and said two dielectric substrates are joined together by thermocompression bonding using said metal

or said material containing metal.